931381

# PATENT SPECIFICATION

NO DRAWINGS

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COMPLETE SPECIFICATION

## Improvements in or relating to Ultra-violet Radiators and Envelopes therefor

We, PHILIPS ELECTRICAL INDUSTRIES LIMITED, of Abacus House, 33 Gutter Lane, London, E.C.2, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to ultra-violet radiators and is concerned with quartz-glass envelopes therefor provided with a layer which shall substantially pass all radiation of a wave-length above 2100 Å but substantially absorb all radiation below 1900 Å which is responsible for the formation of ozone from the atmospheric oxygen.

It is has been proposed for this purpose to use an envelope consisting of bright quartz-glass which is covered with a thin, transparent layer of lead oxide in a quantity of from 0.019 to 0.065 mg. of Pb per $cm^2$ of surface. This lead oxide is provided by depositing from vapour. Lead oxide vapours are extremely poisonous and therefore extreme precautions should be taken. In addition, heating must be carried out in a strongly oxidising atmosphere, since lead oxide is readily reduced to metallic lead which is most undesirable for this use.

We have discovered that zinc oxide and/or zirconium oxide, as far as the above filtering action is concerned, show a much more favourable transmission variation as a function of the wavelength than does lead oxide. In addition these oxides are not poisonous.

According to the present invention, an envelope is used for ultra-violet radiators, which envelope consists of quartz-glass without any additions, which envelope is provided at its surface with a layer consisting of zinc oxide and/or zirconium oxide in a quantity of from approximately 0.01 to 0.5 mg per $cm^2$. Such as ZnO- and/or $ZrO_2$-layer is entirely colourless and transparent to visible light.

[*Price 4s. 6d.*]

The invention includes such envelopes and ultra-violet radiators comprising the same, and methods of manufacturing the same as will be further described below.

In order to provide such a ZnO- and/or $ZrO_2$-layer on quartz-glass in a simple manner, the surface of such glass may be wetted with a solution of a zinc- and/or a zirconium compound which can be converted into zirconium-oxide and/or zinc oxide by hydrolysis and/or or pyrolysis, and then heated at a temperature at which such hydrolysis and/or pyrolysis occurs. Such temperature may be approximately 400—700° C. When manufacturing an ultra-violet radiator, the radiator may be manufactured with an envelope consisting of normal quartz-glass without any additions but having been first sprayed with a solution of zinc and/or zirconium compounds as aforesaid, and the radiator then left to burn, for example, for a few minutes. The rise in temperature so experienced by the envelope as a rule is sufficiently high to cause the above hydrolysis and/or pyrolysis reaction.

Suitable zinc compounds which yield zinc oxide by hydrolysis and/or pyrolysis, are for example zinc chloride, zinc nitrate, zinc acetate or zinc stearate; a suitable zirconium compound is for example zirconium chloride.

By way of illustration, certain specific examples of methods embodying the invention will now be set forth.

### EXAMPLE I

A tubular ultra-violet radiator having an envelope consisting of quartz-glass is dipped in a solution containing 20 gms of zinc acetate in 400 ml of methanol and is then slowly removed from the solution at a constant speed and in a vertical position.

The radiator is then connected to the volt-

age source and left in operation for a few minutes.

The whole process is then repeated another three times.

The layer thus formed contains 0.08 mgm of ZnO per $cm^2$ of surface. The transmission for the radiation of 2300 Å and higher is approximately 90%; that for radiation below 1900 Å is approximately 10%. Even when using the radiator for a prolonged period, ozone cannot be detected.

## Example II

In the same manner as described in Example I, an ultra-violet radiator having a quartz-glass envelope is treated with a solution of 20 gms of zirconium oxychloride ($ZrOCl_2$) in 400 ml of methanol, and the zirconium compound in the film obtained then converted to oxide by heating by running the radiator. The dipping and heating operations are repeated six times. A radiator is obtained having substantially identical properties as that described in the previous example.

Modifications within the scope of the invention may be made in the specific procedures described. For example the concentrations of the dipping solutions may be varied somewhat; at higher concentration the operation need not be repeated as many times.

WHAT WE CLAIM IS:—

1. An envelope suitable for an ultra-violet radiator which envelope consists of quartz provided with a layer comprising zinc oxide and/or zirconium-oxide in an amount of from 0.01 to 0.5 mgm per sq. cm., which oxide layer substantially passes all radiation having a wavelength above 2100 Å but substantially absorbs all ozone-forming radiation below 1900 Å, the quartz itself being substantially without any additions effecting such absorption.

2. An ultra-violet radiator having a quartz-envelope provided with a layer comprising zinc oxide and/or zirconium-oxide in a quantity of from 0.01 to 0.5 mgm per $cm^2$ which oxide layer substantially passes all radiation having a wavelength above 2100 Å but substantially absorbs all ozone-forming radiation below 1900 Å.

3. A method of manufacturing a quartz-envelope for an ultra-violet radiator as claimed in Claim 1, which method comprises wetting an envelope consisting of quartz-glass without additions, with a solution of a zinc- and/or zirconium compound which, by hydrolysis and/or pyrolysis, is convertible into zinc oxide and/or zirconium oxide, and then heating at a temperature at which such hydrolysis and/or pyrolysis occurs.

4. A method of manufacturing an ultra-violet radiator or a quartz-envelope therefor as claimed in Claim 1, substantially as herein described with reference to either of the foregoing specific examples.

5. A quartz-envelope or ultra-violet radiator incorporating the same, when manufactured by the method claimed in Claim 3 or Claim 4.

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